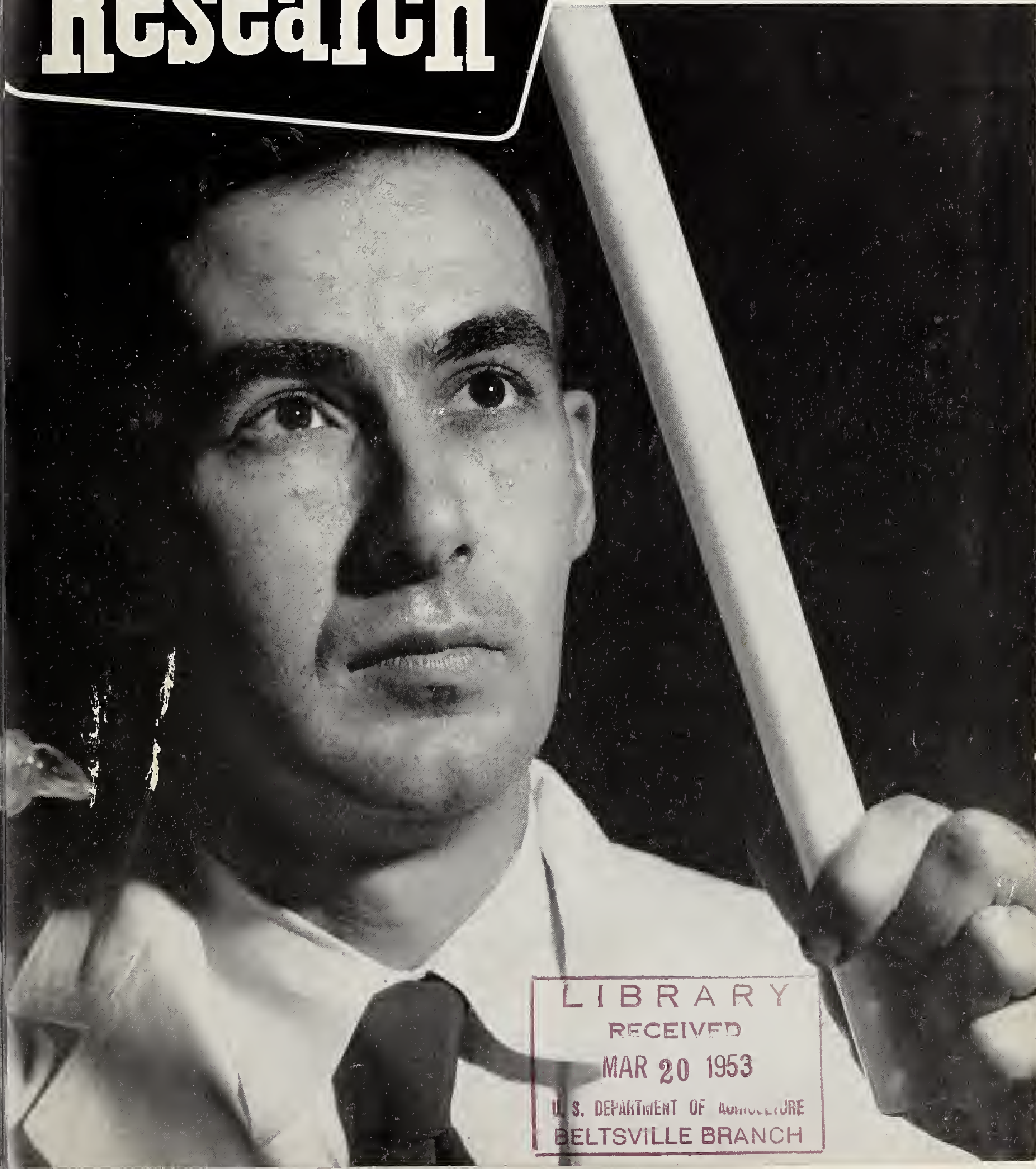
# AGRICULTURAL Research

JANUARY–FEBRUARY 1953



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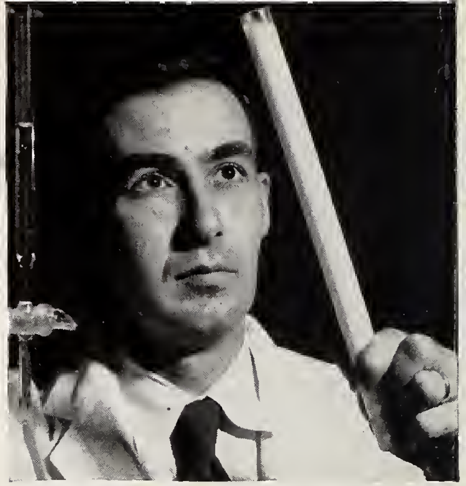
VOL. 1 — JANUARY - FEBRUARY 1953 — NO. 1

JOSEPH F. SILBAUGH — ASS'T EDITOR

SCIENTIFIC CURIOSITY: our cover suggests the questioning spirit of science. Every unexpected phenomenon is a challenge. It is this attitude that gives rise to great discoveries.

## To do a Better Job

This first issue of AGRICULTURAL RESEARCH marks a new milestone in our efforts to do a better job of reporting on research and regulatory work. We have had the encouragement and endorsement of many groups interested in agriculture. The Agricultural Research Policy Committee and several of the advisory committees have recommended a monthly progress report. The Doane Study Group, appointed by the House Committee on Agriculture in 1950, made a similar recommendation.

This publication is designed primarily—

(1) To furnish the latest research findings to those who work directly with farmers, processors, marketing agencies, and the general public. These include extension workers, vocational agriculture teachers, other Federal and State workers, advisory committees, farm organizations, farm press and radio, and trade associations.

(2) To provide progress reports to Federal and State research workers, research organizations, and Members of Congress.

It is often said that it takes a generation for a discovery to come into general use. Under present conditions, we must do everything possible to shorten this time lag. We invite your suggestions as to how we can make this publication best serve that purpose.

E. G. MOORE
*Coordinator of Research Publication,*
AGRICULTURAL RESEARCH ADMINISTRATION.

## Advisory Groups Meet

Annual meetings of several Research Advisory Committees have been scheduled for 1953. Here's the calendar for the first three months:

JANUARY: 12–14, Poultry. 20–23, Deciduous Fruit and Tree Nut. 21–23, Cold Storage. 26–30, Dairy. 29–30, Sugar. FEBRUARY: 2–4, Grain. 11–13, Oilseeds and Peanut. 16–18, Vegetable. 24–26, Feed. MARCH: 2–4, Tobacco. 9–11, Citrus Fruit. 11–13, Transportation. 23–25, Seeds. 23–25. Potato. 24–27, Rice. 30–APRIL 1, Cotton.

## Contents



IN THE NEXT ISSUE

- SCIENTISTS are massing their wits to attack the threatening pink bollworm, world's worst cotton pest.
- NEW orange-juice powder retains the taste and quality of fresh juice and can be stored on the kitchen shelf.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AGRICULTURAL RESEARCH ADMINISTRATION
United States Department of Agriculture

# We must break more *Ceilings* . . . .

by Byron T. Shaw, Administrator
Agricultural Research Administration

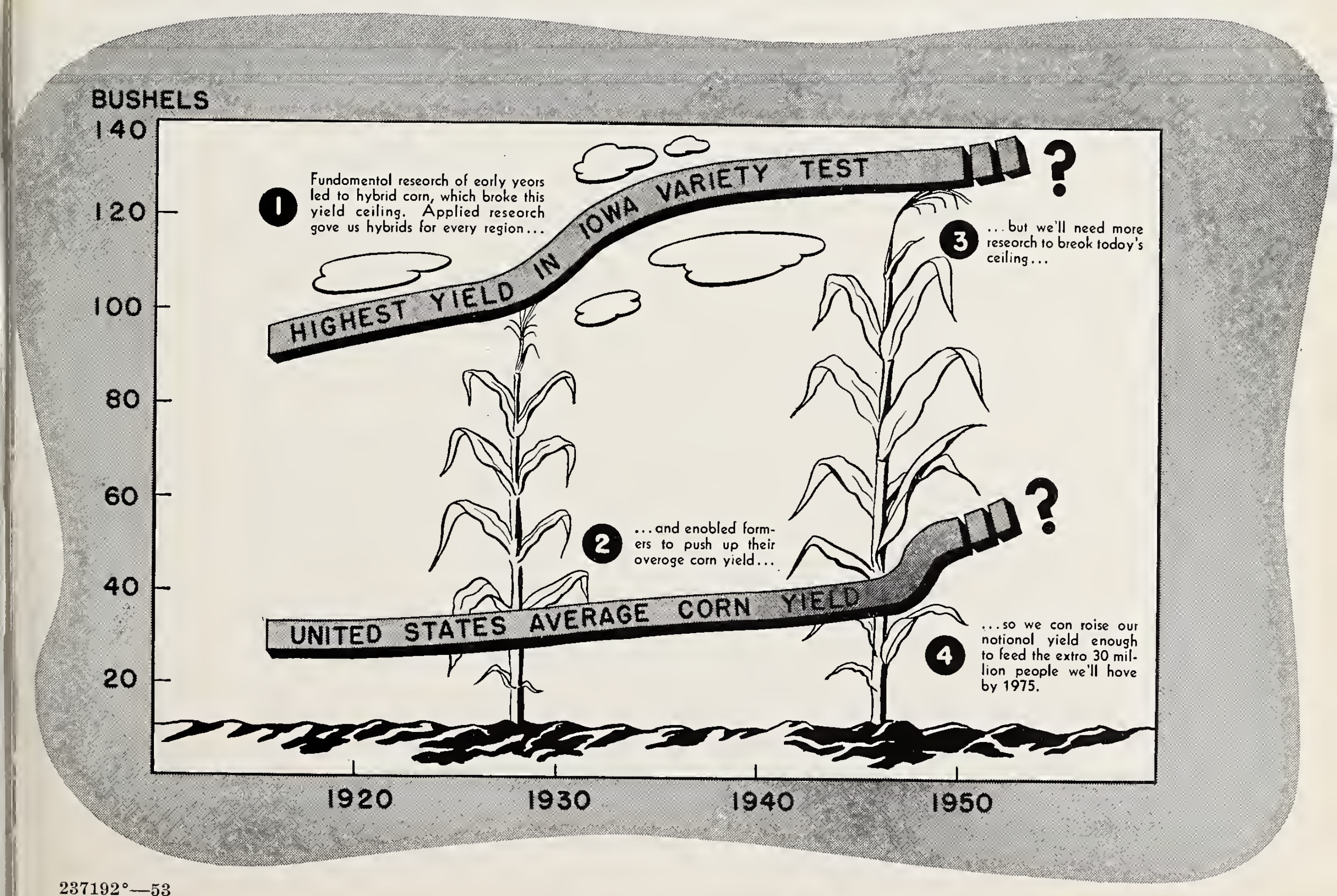
Take a look at the chart below and you'll have this story. What does it mean? Just what it says—that increased yields on farms depend largely on research discoveries that will break through present ceilings.

The people of this Nation are depending on agriculture to supply their needs for food and other farm products—not only today but 10, 25, and 50 years from now. This means that American farmers will have to produce about 30 percent more by 1975 if they are to provide adequately for the 190-million population we will have by then. And they will have to do it with relatively little added acreage.

In that case, how can we expect them to produce an extra billion bushels of corn, nearly 4½ million bales of cotton, almost 3 billion pounds of beef, and more than 1½ billion dozen eggs in 1975? The answer is clear: they will have to produce more per unit of land.

How can this be done? In my opinion—and in the opinion of many I have talked to—the answer lies in research, out of which will come significant discoveries that will raise the ceiling for the average producer's yields.

None of us fears that this country will go hungry—there are many ways to prevent that:

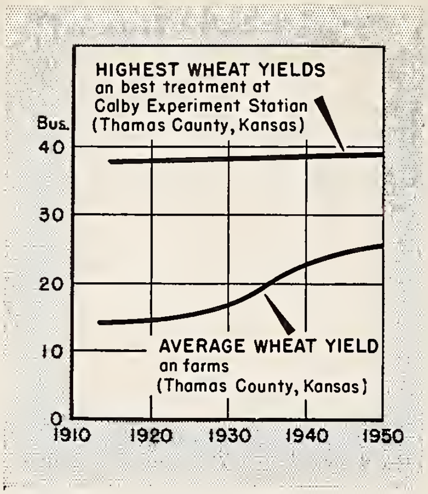


For one thing, we could bring in more land than is now considered feasible. This course, however, would mean higher food prices. We could—if absolutely necessary—rely more on direct human use of plant products. But we are a meat-eating and milk-drinking people, and we want to maintain and improve our diets at costs we all can afford.

We have reached the stage with most farm commodities where opposing forces—insects, diseases, soil deterioration—are pushing down as hard as research is pushing up. In general, production of experimental crops, flocks, and herds has leveled off in recent years.

The average producer's ceiling is still rising for the most part. This is largely because of the average time lag of 10 to 15 years between discovery and use of scientific findings. Increased yields on farms during the last few years mean we have used up a lot of our reserve of scientific knowledge.

Under these conditions, we can expect the average producer's ceiling to level off unless the research ceiling is pushed upward again. How long this leveling off takes will depend heavily on conditions favoring adoption of new practices. High prices and greater emphasis on extension work




**WHEAT research ceiling (top line) has not been broken in 35 years. Improved varieties and cultural practices raised average grower's yield (lower line) about 10 bushels per acre. But unless the research ceiling is raised, our average yield will not go much higher.**

and other aids could enable farmers to push their ceiling closer to the ceiling set by research knowledge. But in spite of present conditions, a leveling off in the average production ceiling for several commodities seems imminent.

Our current position in research is unfavorable. We are not turning out new findings as fast as they are being used. We must push the research ceiling upward at a faster rate if we are to maintain a backlog to be called on in case of emergency. In fact, we must run fast just to keep even.

There are two ways to push our research ceilings higher: by increasing the quantity of research, and by improving the quality of research. Farm people, farm leaders, and the public at large determine quantity. Scientists themselves are responsible to a great extent for the quality of research.

Improved quality, in my judgment, means that more attention must be paid to fundamental research. It is true that important practical problems attract research funds. But it is also true that many—perhaps most—important practical problems require basic as well as applied research for a complete solution. It is through fundamental studies that the really big discoveries are made—the kind that break through research ceilings and lead to the biggest gains on farms.

The job ahead of us is to increase production wherever possible, prevent declines in production, cut waste and spoilage in goods during handling and marketing and in the home, and make better use of all agricultural products.

The fundamental approach to these practical problems is involved and difficult, but it will be the most direct path to our goal.

## Taking a look at Research

More USDA research funds should be used for fundamental research. This recommendation came from Advisory Committee chairmen at their November meeting.

They also urged that every effort be made to maintain a balance in research among the marketing, production, and utilization fields. Marketing research—both fundamental and applied—needs more attention, they believe.

These chairmen are the heads of the 26 Advisory Committees appointed under the Research and Marketing Act during the last few years. The advice of producers, processors, and marketers who make up these committees has been of great value in developing research and marketing service work of the Department of Agriculture.

Committee functions include (1) reviewing and evaluating USDA research and marketing service programs; (2) recommending adjustments and priorities for new or expanded work; (3) helping to obtain the cooperation of producers, industry, and others in carrying out research programs; and (4) developing a better understanding of the nature and value of agricultural research and encouraging wider and more rapid application of results.

Committees hold some of their annual meetings at ARA laboratories and State experiment stations where they can see research under way.

# What's in a Cow's Rumen?

**In her four stomachs, a cow can hold 120 to 180 quarts. She can eat 100 pounds of grass daily and drink 10 to 15 gallons of water. The rumen is the largest of these four stomachs.**

New discoveries about how the cow makes her own protein may change some of the old ideas about cattle feeding.

Promising leads in the laboratory still must be turned into feed lot practices. But cattlemen already are talking about what has been learned in feeding tests at State experiment stations.

The prospects show why:

Poor quality forage may become more useful. Corncobs, straw, cottonseed hulls, sorghum bundles, even last year's hay may yield a lot of energy and some protein and minerals when we learn how to use such low-grade products.

Urea, the high-nitrogen material made from coal, water, and air, may extend feed supplies by replacing part of the oil meals and other concentrates in cattle rations.

All this is suggested by new light thrown on bacterial fermentation in the largest of the cow's four stomachs, the rumen.

Experiments in the use of urea are based on knowledge that certain rumen bacteria use the nitrogen in urea to make amino acids, the building blocks of protein, in their own bodies. When these bacteria pass on through the other stomachs and die, they are digested and the body proteins of the bacteria become a source of protein for the cow.

It's the rumen that enables a cow to take a lot of fibrous material. The micro-organisms break down cellulose, such as that in straw or corncobs, into products the animal can use.

Studies at ARA's Agricultural Research Center have shown that there may be 50 to 60 different kinds of bacteria in a cow's rumen. But we don't even have names for these bacteria, nor do we know definitely which help and which may hinder normal rumen action. We do know their numbers are enormous; 17 billion have been found in a space the size of a kernel of corn.

Scientists are trying to learn more about the nature of the bacteria and the part each kind plays in the digestion, nutrition, and physiology of the cow. Fundamental studies on digestion and metabolism now under way in the Bureau of Dairy Industry, and in cooperation with Michigan State College, should produce the answers we need.

How efficiently can we use urea? What changes occur in rumen bacteria under various conditions? Can we encourage the development of desirable micro-organisms in the digestive system? Questions such as these must be answered before we can realize the possibilities shown by the recent feeding tests.

In some experiments, satisfactory gains have been made by feeding urea along with corncobs and other low-quality roughages. In general, limits of toxicity have been determined and commercial feed makers are offering rations containing urea as a source of nitrogen.

More research is needed on feeding urea to both beef and dairy cattle before the question of costs and returns to farmers can be settled.

A recent Bureau of Agricultural Economics survey showed that Corn Belt farmers should be able to use urea profitably in fattening beef cattle. It probably would pay in feeding growing cattle or in wintering cattle in the Great Plains and western Corn Belt. But for urea to make money as an oil-meal substitute in dairy rations, the price of oil meal must be better than 1¼ times the cost of grain.

Probably the best prospect for urea is as an extender of feed supplies, when fed with such materials as corncobs and other farm wastes. There never has been enough high-protein feed. If new developments help us spread our available supplies over more cattle, we can increase our beef and dairy production for human food.

## Cattlemen pocket the proof

Evidence is piling up that proving beef bulls really pays. A recent study of 181 steers sired by bulls at the Bureau of Animal Industry's Miles City (Mont.) field station showed decided hereditary differences in ability

to gain, weight for age, and conformation. For example, feeding tests of 8 steers each from 13 bulls showed a difference between the best and the poorest individuals of 119 pounds in weight at weaning and 211 pounds at the end of the feeding period. In net returns above feed and marketing costs, there was $56 per head difference. So the best bull returned $448 more on his 8 calves than the poorest bull.

Bulls proved for breeders at the Montana Agricultural Experiment Station have shown a difference of 30 to 40 percent in rate of gain. Similar differences are showing up at many other State stations.

Many Montana ranchers are proving bulls on their own ranches, and commercial cattlemen are looking for such bulls. Feeder buyers have paid premiums of $2.75 to $3 per hundred for steers from herds in which bulls have been selected for rapid and efficient gains.

## Saving on Cotton

The new cotton opening and fluffing machine developed by the Bureau of Agricultural and Industrial Chemistry is proving its merit. Textile mills have installed at least 13 of the openers, which make cotton clean easier and spin better.

One mill reported that the opener improved yarn quality and, at the same time, saved $2 per bale of cotton, or $80,000 a year. In another mill, the machine paid for itself in less than 10 weeks—a saving of almost $1,000 a week.

Mechanically harvested cotton usually contains more trash than that picked by hand and often is graded down. If all the low-grade cotton from the 1951 crop had been processed through the opener, yarn manufacturing costs could have been reduced by some 7½ million dollars.



# Packing Costs can be Cut

Tomato prepackaging plants could save 2¼ million dollars a year by adopting more efficient handling methods, say Production and Marketing Administration specialists after a study of 14 plants.

On the average, these plants could increase their labor efficiency by 36 percent if they used the best practices from all the plants.

Most of the savings would come from more efficient sorting and packaging operations. For example, partial tray filling at a conveyor belt, using two to five operators to pack a tray, was more efficient than the method in which each operator fills a complete tray. And sorting from a conveyor belt onto other conveyor belts was the most efficient of four different sorting methods observed.

Packers should make sure that increased efficiency is not achieved at the expense of rougher handling, which might lower tomato quality. However, less labor was required when tomatoes were received in 60-pound jumble-packed containers rather than 32-pound standard lug boxes, in which tomatoes are wrapped and hand-packed.

Suggested layouts were developed for small and large prepackaging plants, based on a combination of methods to give greatest labor efficiency. These plans are in the study report, which may be obtained from Office of Information Services, Production and Marketing Administration, Washington 25, D. C.

SORTING tomatoes from a conveyor belt to other conveyor belts takes only 20 man-hours for a 24,000-pound carload, compared with an average of 34 man-hours for all the plants.

FILLING by partial-tray method, crew of 10 can fill 3,970 packages of tomatoes an hour, compared with an average of only 2,880 packages in the 14 plants covered in the survey.

DEFORMED, puffy fruit developed on tomato plants that were treated with the "L" form of the compound joining 2,4–D with amino acids.

SEEDLESS, meaty tomatoes formed when the "D" compound of 2,4–D and amino acids was used. Fruit-set was good, scientists found.

# Tamed 2,4–D Sets Seedless Tomatoes

Tamed with amino acids, 2,4–D has produced a seedless greenhouse tomato.

The new compound is still just a laboratory chemical—not something that can be recommended for use by tomato growers, explain plant physiologists Paul Marth and J. W. Mitchell of the Bureau of Plant Industry, Soils, and Agricultural Engineering.

But results so far suggest that this fundamental research on plant growth regulators may pay off early with a practical byproduct.

Spraying greenhouse plants and their blooms with the modified 2,4–D caused the seedless tomatoes to develop without pollination. In fact, fruit-set was much greater than on hand-pollinated plants.

A question still to be answered is the keeping and shipping quality of such tomatoes. Some research men have noted a premature softening in certain varieties when a growth regulator was used to set fruit. Marth and Mitchell plan to check this point, as well as to make field tests with the new compound.

What ARA scientists have done is to harness the power of weed-killing 2,4–D by linking it chemically with certain amino acids made in the laboratory. T. D. Fontaine and J. W. Wood of the Bureau of Agricultural and Industrial Chemistry came up with two compounds:

1. An "L" form, which made fruit set but deformed the tomatoes and plants.

2. A "D" form, which produced the meaty, seedless fruits without apparent injury to the greenhouse tomato plants.

The reason tomatoes reacted differently to these two compounds probably lies in the enzymes of the plant, say the chemists. The tomato enzyme system, like that in humans, serves as an assembly line to help make chemicals necessary for health and growth.

These enzymes must have split the link of 2,4–D and amino acid in the L compound—and thus left the tomato open to the bad effects of 2,4–D. The D link, on the other hand, could not be broken and this compound was able to set fruits without causing injurious effects.

## Ripening makes the difference

To make the best juice, apples should be held in the warehouse for at least 2 weeks after harvest.

This conclusion comes from the Bureau of Agricultural and Industrial Chemistry in its search for new uses for apples low in market quality. The work is being done at the Prosser (Wash.) laboratory in cooperation with Washington State Tree Fruit Experiment Station.

Tests with the Delicious variety showed that apples held in storage for 2 to 4 weeks made the best flavored juice, even though they had remained on the tree for 16 days after normal harvest. Although juices from Fancy to Extra Fancy fruit had a little more flavor and sugar than those from C grade apples of the same harvest and handling, the biggest difference came from the extra ripening both before and after harvest.

By picking well-colored apples first and leaving poorly colored fruit on the trees to be harvested later, growers could assure good-quality juice and avoid handling costs for low-grade fruit at the packing house.

## Better Bulletins

USDA Farmers' Bulletins are going to get a face-lifting.

A recent workshop is part of a Department-wide effort to make bulletins and other publications more useful. State experiment station editors joined in the discussion of how to improve appearance, reduce costs, and add new information.

Approximately 300 bulletins are to be revised.

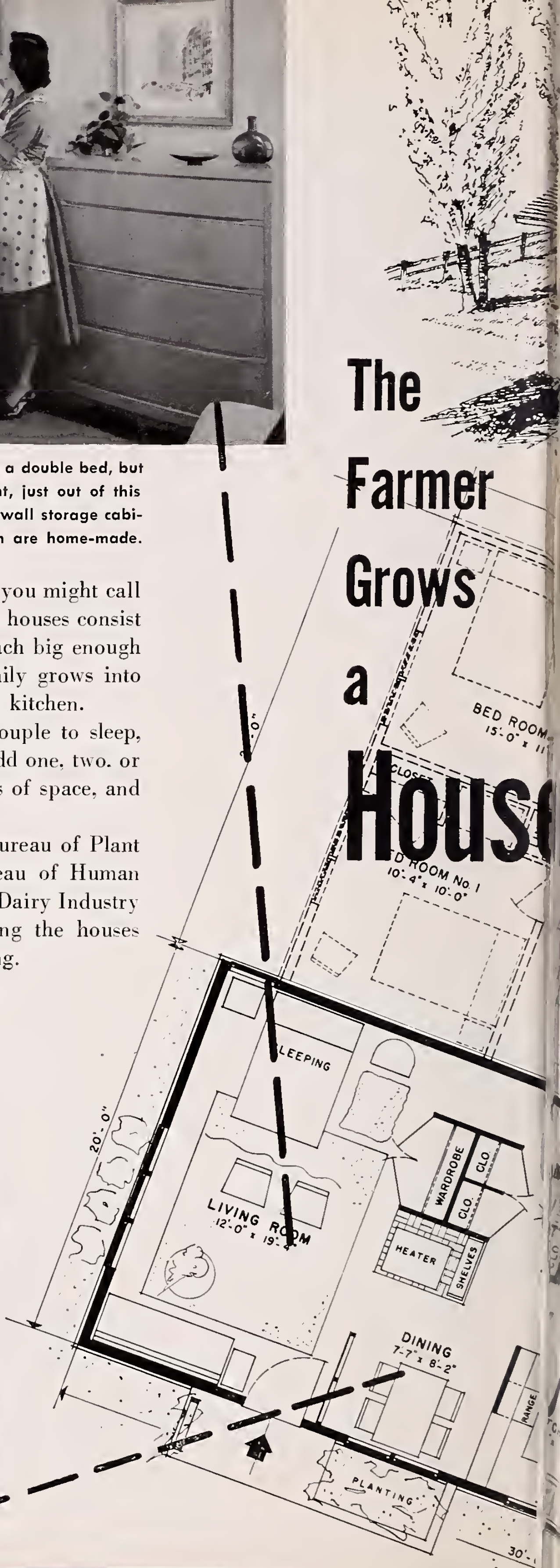
LIVING ROOM doubles as bedroom. One end of room could be curtained for a double bed, but using two bed-lounges gives more living space (other bed-lounge is on right, just out of this picture). By day, slip-covered beds slide back 12 inches under home-made wall storage cabinets to make comfortable sofas. Small tables (at left) and window bench are home-made.

# The Farmer Grows a Hous

ARA is giving the expansible house a new dimension: you might call it "basic big enoughness." These new experimental farm houses consist of basic living room, kitchen, closet space, and bath—each big enough to fit a larger house as bedrooms are added. The family grows into bedrooms without growing out of the living room and kitchen.

There are laundry facilities, as well as space for a couple to sleep, in the basic unit. And it doesn't need to be altered to add one, two, or three bedrooms. Many different materials, arrangements of space, and cost-cutting ideas are being tried.

Joining in the design and study of these houses are Bureau of Plant Industry, Soils, and Agricultural Engineering and Bureau of Human Nutrition and Home Economics. Families of Bureau of Dairy Industry milkers at the Agricultural Research Center are renting the houses and will report how they stand up under the test of living.




DINING AREA is set off with two-by-four trellis that keeps room light and airy. Pass cupboard is handy for serving from kitchen. The heater and roomy closets form a compact unit (at left), and folding closet doors save space. Work clothes won't soil either plywood or plastic-covered chair.

HOUSE A: foundation of concrete grade beam on piers. Concrete floor slab. Asbestos cement board siding, with 2 inches of insulation, and wallboard inside. Studs on 24-inch centers. Barn-sash windows are attached to studs.


KITCHEN includes laundry area (at left, not shown). One counter section is built for seated work. Home-made U trough gives good lighting with fluorescent tubes. Many different floor and counter coverings and wall finishes are being tested.

HOUSE B: cinder-block walls, finished outside with waterproof cement paint. Inside insulating plaster is put directly on blocks. Vermiculite insulation used in block cores.

HOUSE C: wood floor on brick piers. Roll roofing on ground seals out moisture. Diagonal sheathing applied on 24-inch centers (braces frame, holds siding). Studs are set on standard 16-inch centers.

# Frozen Bread will stay fresh

A frozen loaf of baked bread that stays fresh at least a year is one of the new ideas in baking that could sell more bread and make housewives happier.

Fresh bread is more than a dinner-table problem. The stale loaves that come back from the grocery store are one of the reasons bread prices are high.

The baker can't do much about the cost of labor or bread ingredients. So he's looking for savings in spots where he has some control: making the bread and delivering it.

Pushing along this progress is research on staling that the American Institute of Baking is doing for Bureau of Agricultural and Industrial Chemistry and Production and Marketing Administration.

One important result of these studies has been finding a way to separate the gluten (protein), starches, and solubles of wheat flour on a large scale. These parts can then be put back together in new proportions. Protein, for example, can be stepped up beyond the normal 10 to 11 percent.

Suppose this process proves practical for the industry. Millers equipped to fractionate wheat and rebuild it could allow for the see-saw of wheat protein, which varies in quality and quantity from year to year and from one part of the country to another.

Proposed research will show if it is feasible to use low-protein wheat by raising the proportion of gluten and reconstituting the flour. Such flour would be fine for use in the new "continuous doughmaker." This machine uses air pressure to join the flour and other ingredients in a steady flow to the oven, doing away with today's stop-and-go trip through the fermentation room and many separate machines. At present, low-quality bread wheat won't stand up through those steps.

As for high-protein bread, it's a good stockpile idea for emergency feeding. A 20-percent-protein bread made with a high level of milk, plus vitamins now used, could serve as a nearly complete food for short periods of time.

What about the frozen bread? Your grocer may have it within 5 years, says PMA baking technologist Philip Talbott. Then, if grocers generally go along with the new practice, your bread will be as fresh as when it came from the oven.

Bakers, in that event, wouldn't have to worry about returns of stale bread. "Shop cripples"—warm loaves crushed during slicing and wrapping—might be cut out entirely.

Frozen-bread bakeries could work right through on slack days, putting the extra loaves into cold storage. That would cut down on extra-long days and night work.

Talbott thinks the savings may take care of the freezing—and offset rising costs, too.

There are many questions: how soon and how fast to freeze; whether to slice and wrap the loaf before or after freezing. Research men hope to find the answers.

## New blends have real Maple Flavor

A "high-flavored" maple sirup that can be blended with corn or cane sirup to give it the delicious maple flavor is the result of recent research by the Bureau of Agricultural and Industrial Chemistry.

Pure maple sirup, a luxury food, is valued solely for its delightful flavor. Yet, the sap as it comes from the tree has no flavor or color. Chemists at the Eastern Regional Laboratory discovered that the natural reaction that causes unwanted browning in many foods is responsible for the development of color and flavor of maple sirup. Heat turns the trick.

The trouble with the usual method—when it is used to make a concentrated sirup for blending—is that boiling at a heat high enough to increase the flavor turns the sap to sugar. In a simple process worked out at the Laboratory, the sap is boiled for 2 hours at 250 degrees F. to a thicker sirup than usual. Then water is added to obtain the desired consistency.

The resulting sirup has four to six times more flavor and much deeper color than ordinary maple sirup. It is now being made commercially for use in blended sirups and is increasing the demand and expanding the market for maple sirup. The new blend is making it possible for thousands to enjoy the pure maple flavor who could not afford it before.

# Now it's easy with EQ-53

Homemakers can stop worrying about moth damage to washable woolens. This spring, mothproofing will be just a matter of adding a few spoonfuls of EQ–53 to the wash or rinse water.

EQ–53 is the name of a wool-protecting chemical developed by the Bureau of Entomology and Plant Quarantine. The product is expected to be on market shelves by the time homemakers begin to prepare their woolens for storage this year.

A mixture of the insecticide DDT with chemical carriers, EQ–53 offers a simple way to save blankets, sweaters, and other washable woolens from fabric pests.

Adding to the wash water as little as a tablespoon of the solution for each pound of woolens will impregnate the fabric with DDT. Woolens treated in this way are protected against clothes moths and carpet beetles for more than a year.

EQ–53 works in the wash or rinse, or as a special application after rinsing. The treatment can be made in most any home washing machine as well as in a tub or basin.

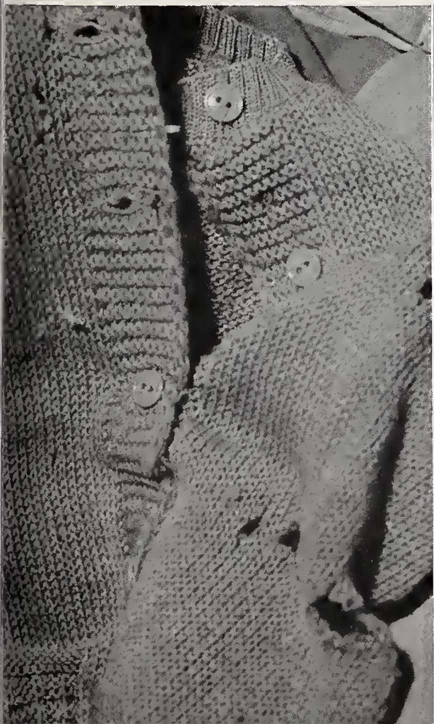
Entomologists say EQ–53 is safe, requiring only the normal precautions in using any insecticide.

The formula was developed by Hamilton Laundani and his associates at BEPQ's Savannah (Ga.) laboratory. These research men already had worked with the Army Quartermaster to devise a way of protecting stored wool fabrics by treating them with DDT on a large scale.

Now, the laboratory has perfected a treatment for home use. In EQ–53, the DDT is dissolved in an oily solvent. An emulsifier is added to disperse these chemicals through the wash water in countless numbers of minute droplets that carry the insecticide. Wool, the scientists found, can pick out the DDT and hold it.

You've probably guessed that the name EQ–53 comes from the entomologists' bureau title, plus the year—53. The formula, of course, will be available to manufacturers without charge, and the product should be relatively low in cost.

**MOTH DAMAGE** to washable woolens can be prevented by adding EQ–53 to wash or rinse.




## Clue on Oak Wilt

Forest pathologists have a new clue in the mystery of how oak wilt spreads—a mystery we must solve before we can control the disease.

Recent laboratory research reveals a form of oak wilt fungus that reproduces sexually and forms spores under the bark of diseased trees. These spores can stick to the feet of birds or insects. This form, as well as the previously known spore stage, may spread the disease.

Oak wilt is fast becoming a real threat to our oak forests.

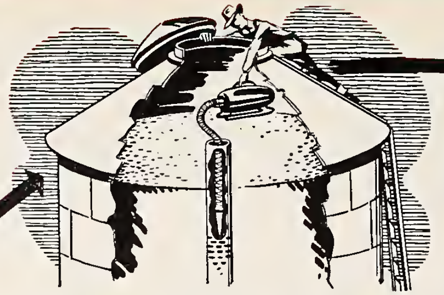
## Forest and Range

Increased research on the role of forests and ranges in flood control, sediment control, and water yield has been urged by the Forest Research Advisory Committee.

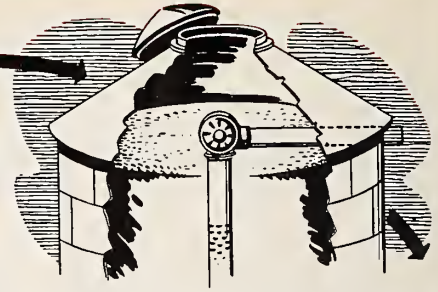
Other proposals by this new group include replacement of noxious weeds and unwanted brush with productive forage on nearly 250 million acres of western range land.

The committee recommended development of a more effective fire hazard rating system and establishment of extra hydrologic laboratories.

# Small Fan may save STORED GRAIN



PIPE is inserted in center of bin by using home vacuum cleaner to draw grain out of pipe as it is pushed down. Made of 4-inch galvanized iron spouting, pipe is 9 feet long, has hundreds of narrow slits in lower 6 feet.



FAN and outlet pipe are added. Fan draws 35 to 50 watts, moves 50 to 100 cubic feet of air per minute. It costs about $20. Pipe connections, wiring, and cost of installing the system probably add another $30 or $40.

Farmers may find in a small fan and a piece of spouting the answer they need to keep a large quantity of grain in good condition during winter storage.

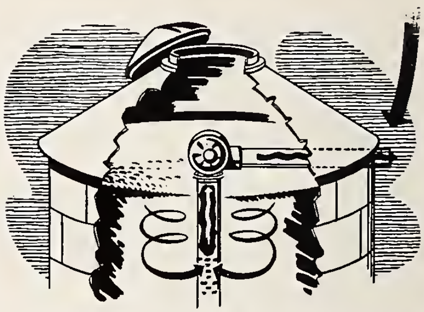
Tests now under way in Government storage bins in Indiana, Nebraska, and Iowa show high promise.

The big problem in storage is the tendency of parts of the grain—usually the center—to heat up. Heavy insect infestation usually causes these hot spots. Wide temperature differences within the grain bring about currents that move moisture from the warm areas to the cool. Most of the moisture gathers at the top, and the grain may cake and eventually spoil.

In tests with the small fan, the center of the grain has cooled substantially, reports engineer W. V. Hukill of the Bureau of Plant Industry, Soils, and Agricultural Engineering. To be permanently effective, the treatment should not leave any heated spots.

If the plan works, it also could give farmers 8 to 10 percent more storage by allowing them to heap up grain in the center of the bin.

More definite conclusions will be available this spring.



GRAIN in the middle of bin slowly cools as suction from pipe counteracts the tendency of warm air to rise in the center of the pile. This is hard on insects. Cooling takes time, but the fan can run continuously at low cost.

## We're gaining on 15-B

Several hybrid wheats that show resistance to stem rust 15–B are under test this year.

We don't yet have a variety ready to pass on to farmers. But we know how to do the job and it's just a matter of time, says H. A. Rodenhiser of the Bureau of Plant Industry, Soils, and Agricultural Engineering.

A bread wheat from Canada, known as CT–186, looked good last year. Others include two Fontana × Thatcher lines and a Timstein × Henry hybrid from Minnesota.

Two durum wheats from North Dakota show ability to produce a crop even under severe rust.

Many resistant winter wheat hybrids are under test.

Scientists have found new sources of resistance during the last 3 years in their tests of nearly 13,000 wheats in the U. S. World Wheat Collection. Bread wheats from Kenya and Egypt, and durums from Portugal, India, Transvaal, and Canada show promise.

Those varieties are not adapted to this country, but scientists are using them as breeding stocks to build resistance into high quality wheats that will do well here. Thousands of lines are being tested under the most severe rust conditions in the United States, Mexico, South America, Virgin Islands, and Puerto Rico.

One of the biggest problems is that rusts themselves form hybrids on the barberry host, creating new races to which the wheat may not be resistant. This is one of the reasons it's so important to eradicate barberry in this country.

But don't think the scientists are going to be outdone. They are learning more and more about how resist-

ance is inherited. With this knowledge, they are building a higher, wider barrier against rust in the new hybrid wheats.

## More good seeds for 1953

Farmers will be able to buy more seed of improved forage crop varieties in 1953 than ever before, owing in large part to the efforts of the National Foundation Seed Project.

Alfalfa is the brightest spot. There should be approximately 27 million pounds of Ranger, 7 million pounds of Buffalo, and 1.5 million pounds of Atlantic available this year. Although Narragansett has been in the Project only since 1951, some 25,000 pounds of seed will be offered in 1953.

This estimated 35 million pounds of alfalfa looks even bigger when compared with 1.4 million pounds of the new varieties available for 1948–49.

The 2.5 million pounds of Kenland Red Clover and 150,000 pounds of Tift Sudangrass for 1953 planting will be about the same as last year. Supplies of Climax Lespedeza, another newcomer, will run approximately 5,000 pounds.

Started in 1949 to break a forage-crop seed shortage, the National Foundation Seed Project brought together seedsmen, State agricultural experiment stations and extension services, State certifying agencies, the International Crop Improvement Association, and the U. S. Department of Agriculture. These groups have worked as a team to build up and maintain stock seeds.

Most of the seeds are reproduced in the fast-growing, high-yielding areas of the Southwest rather than in each variety's region of adaptation. Before this change in certification rules, seedsmen saw little chance that there ever would be enough seed.

## Soil Conditioners

There's a lot of difference in soil conditioners. The best ones promise to prevent caking and make heavy soil easier to work. They also may aid in erosion control.

But this doesn't mean they are magic. If you have a heavy clay soil, you can't expect to pour a solution on the hard surface and get a garden loam. ARA soils men say that some of the conditioners will maintain good soil structure, but you have to prepare it first.

The conditioner must be mixed thoroughly with the soil during seedbed preparation. Or a liquid spray on the surface of the prepared seedbed will prevent crusting.

How long the effect lasts is not yet known, but experiments show that products in which polyacrylates are the active ingredients are resistant to soil organisms.

Right now the cost is too high for farmers, although many gardeners are experimenting with small plots. There is a wide variation in the cost of using the commercial products, ranging from 50 cents to $7.90 per 100 square feet. This means $200 to $3,000 per acre.

# Quick test for Fumigants

A better job of insect control in industrial plants, mills, and warehouses is now possible with a new quick method of testing fumigant concentration. So far the method works only with methyl bromide, but research is under way to adapt it to other gases.

G. L. Phillips and J. W. Bulger, Bureau of Entomology and Plant Quarantine, developed the test. It was patterned after a method of detection used by the Armed Services and industry to protect employees working with gases.

Chemical analysis, the usual test by research workers, takes 30 to 45 minutes. Industrial fumigators test concentration of the gas by placing cages of insects through the area being fumigated; if the insects die, the fumigant is strong enough. Neither method is entirely satisfactory.

The new test can be completed in 30 seconds. The equipment is easy to get and easy to operate.

Both laboratory and field trials show this method to be as accurate as chemical analysis. It will be a big boost to industry in routine fumigations, because thorough samplings can be made early enough to permit correction in the dosage.

This test also will simplify the operations of regulatory agencies in routine fumigations of plant products that come in from foreign countries. Research men will have a tool for quicker and more accurate analysis in experimental testing.

FUMIGANT is drawn into tester by suction pump. Amount of electrical current that flows through a heated wire in the instrument's gas chamber indicates concentration of the gas.

# Ins and Outs of the Egg

Imagine an automatic machine that would sort eggs according to both shell and yolk colors, detect blood spots and green rot, show up cracks and weak shells, and measure albumen quality—all without breaking the egg!

ARA scientists are just one important principle away from making it possible to build such a machine. Only the albumen problem remains to be solved.

The scientists are poultrymen Wade Brant of the Bureau of Animal Industry and engineer Karl Norris of the Bureau of Plant Industry, Soils, and Agricultural Engineering. They started 2 years ago to look for scientific ways to measure each phase of egg quality. The plan is to build each principle into a separate automatic machine. Eventually. equipment makers may want to combine them all into one big unit.

The shell-color machine soon will be demonstrated publicly. To please white-egg New York or brown-egg Boston, this machine can sort eggs into six groups varying from white to dark brown. It can even divide "white" eggs into six shades between chalk and cream.

This is done by bouncing light off the eggs and into two photo cells. The reaction sets a trip lever on a revolving egg weigher adapted for the purpose.

To show up blood spots, which cut market value, light is passed through the egg. On this machine, an egg with blood in it will absorb the light at a certain wave length. That giveaway is accurate more than 98 percent of the time, even if the spot is no bigger around than a BB shot. The researchers hope to replace their lab detector with an automatic one soon.

Four other tests have been worked out, but time is needed to turn the principles into machines.

Ultraviolet light shot through an egg at the right wave-length signals green rot readily. This rot thrives in the cool storage needed to keep eggs fresh.

As for yolks, housewives in some areas are fussy about them, and noodle makers pay a premium for dark yellows. Gauging their shade is much like sorting for shell color, except that the light goes on through shell and white and bounces off the yolk.

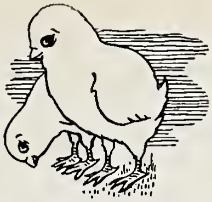
In the test for cracks, a vibration is sent into the egg with a phonograph needle and picked up through other needles not more than half an inch apart. If there's a crack, the wave comes out garbled.

Finding weak shells is just a matter of applying known pressure. The egg can be saved if it breaks at this point.

Measuring albumen quality looks like the toughest job of all, say Brant and Norris. They're working on some leads. If they succeed, you won't have to break an egg to know that the white will stand up firm around the yolk—not flatten out like pancake batter.

**SHELL-COLOR** machine automatically sorts eggs into six groups from white to dark brown.

## Why anti biotics help



Why do antibiotics step up chick growth? Because they protect the young bird while it gets used to the germ world, according to new ARA research findings.

This conclusion came out of an experiment in which two groups of chicks were raised under different conditions. One group was started in new batteries in a new building, every effort being made to keep the quarters clean (even feed bags were sterilized). The other group was raised in old quarters where chicks had been grown for 20 years.

Both groups were split into small lots so that some of the birds in each group could be fed aureomycin in their ration. Here's what happened:

1. Chicks fed no antibiotic in new quarters grew faster than chicks with an antibiotic in old quarters. Both used their feed more efficiently than birds in the old environment without antibiotics.

2. The stimulating effect of antibiotics showed up at 1 week in old quarters and was still increasing after 4 weeks. Antibiotics had little effect on chicks in the clean, new quarters.

3. When chicks were moved from new to old quarters at 4 weeks, and the antibiotic was cut off, growth rate slumped. Yet, there was no slump when the antibiotic was taken away from birds that had been in the old quarters all the way.

R. J. Lillie, J. R. Sizemore, and H. R. Bird, of the Bureau of Animal Industry, believe that chicks raised in the old quarters with an antibiotic became adjusted to the harmful bacteria and developed a tolerance for them. These chicks had no setback when the antibiotic was stopped.

On the other hand, birds in the new quarters got no chance to develop a tolerance. They were wide open to the bacteria when moved to the old quarters.

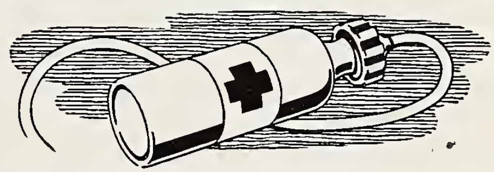
The scientists point out that slow growth in the first few weeks had come to be regarded as "normal" for chicks. Actually, they were getting adjusted to the microbes around them—without the help of the antibiotic we have today.

## Hybrid Lespedeza

Research showing that sericea lespedeza can be hybridized opens the way to breeding better strains of this legume. North Carolina Agricultural Experiment Station cooperated in the studies. Plants differing in type, vigor, tannin content, and seed production have been selected for further work.

In the breeding programs underway, plants from a number of introduced and domestic seed stocks are being studied. Because sericea lespedeza is largely self-fertilized, hybridization is necessary to get strains that carry the desirable qualities.

# Dextran is saving lives



The dextran blood plasma substitute that came from ARA laboratories has gone to war in Korea.

It's not yet perfect, but dextran has proved effective in treating shock, which follows three out of four battle wounds.

This vital fluid can save thousands of lives in an emergency. It can be mass-produced at low cost. And it can be stored without refrigeration.

One chemical firm already is making dextran on a large scale and two others will start soon.

Strangely enough, a bottle of spoiled root beer gave us the bacteria that yielded dextran. A soft-drink maker had taken his problem to the Bureau of Agricultural and Industrial Chemistry in 1943, and scientists saved a sample of the bacteria for their world-famous collection. The sample came in handy.

In 1949, the National Research Council called on the bureau to help find a substitute for plasma. One of the materials that showed promise was dextran. It happened that the Bureau's Northern Laboratory had been studying related starch-like chemicals since 1941.

So the scientists went to work, with the cooperation of the Armed Forces, Public Health Service, and many industries and universities. Dextrans were produced with more than a hundred different strains of bacteria. But it was the old root beer sample, on cane sugar, that did the job best.

There was still the problem of breaking down the large dextran molecule to a size that the body could use—yet not so small that the fluid wouldn't stay in the blood long enough to relieve shock. Today's product is about right, but the scientists are sure they can develop one that's even better.

Of course, this doesn't mean that Americans can forget trips to the neighborhood blood bank. Plasma and whole blood, the materials of choice, are still needed to nurse the injured back to health.

## A new butterfat test

Fat content of ice cream and cheese, as well as milk and cream. can be measured accurately with the new detergent test developed by the Bureau of Dairy Industry.

Everyday chemicals are used in the new method to do the same job that. in the old Babcock test. calls for war-critical sulfuric acid. This acid also is relatively expensive, and it's hazardous to handle.

The new test separates fat with a detergent (like the dishwashing compounds) and a phosphate salt (common as water softener). Then 50-percent mcthyl alcohol is added to raise the fat to the scale in the neck of the test bottle.

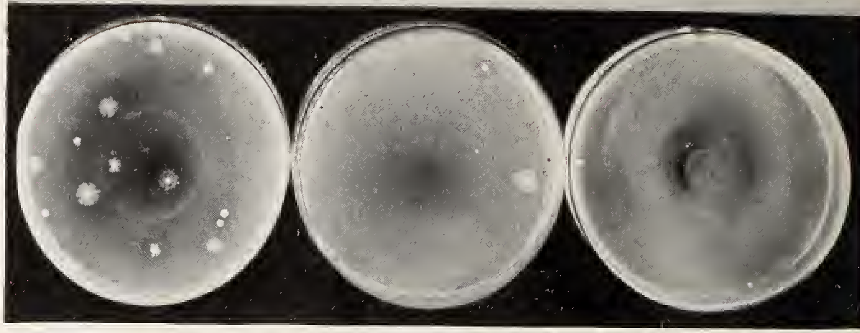
All the equipment, from bottle to centrifuge, is the same as that in the Babcock test. The same procedure is followed. And the result is just as quick and accurate, says dairy scientist O. S. Sager.

## Alfalfa pellets and D

Dairymen feeding alfalfa pellets as the sole roughage for wintering young calves should add vitamin D to the ration. Such calves get little sunshine. and Bureau of Dairy Industry research shows that pelleted alfalfa usually doesn't contain enough vitamin D to protect the calves against rickets.

Alfalfa for commercial pellets usually is cut early and contains less vitamin D than more mature forages. Vitamin D can be added in the form of irradiated yeast.

**Milk without rust—no new spores**



BEGINNING — AFTER 24 HOURS — AFTER 48 HOURS

**Rust in milk—millions of new spores**

BEGINNING — AFTER 24 HOURS — AFTER 48 HOURS

## RUST can ruin milk

Rust in a pail could spoil a whole vat of milk. Bureau of Dairy Industry scientists have shown that the soluble salts in iron rust cause new bacterial spores to form by the thousands when milk stands at room temperature.

This finding seems to explain why condensery milk sometimes suddenly develops a large number of spores that foul processing or cause the milk to spoil later. Usually, the trouble is *Bacillus subtilis.* And those are the spores that showed up strongest in the recent ARA experimental work.

H. R. Curran and F. R. Evans were looking for a way to make spores germinate fast and uniformly so they could be killed with flavor-saving mild heat. They tried adding salts of different metals. The iron salts didn't affect germination—but after germination took place, new spores developed at a terrific rate in the iron-contaminated milk. The milk soon spoiled.

Rusty cans, a few drops of rusty water splashed into the milk, water left in a pail from a rusty washer—all can cause trouble.

Protecting milk from rust is especially important when the milk must take a lot of handling and heating, as in condensery or cheese factory.



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